VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

Presentation at the TAC Meeting on the Aquatic Life Use Impairment Study for the Occoquan Reservoir
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Overview of the Nutrient Criteria for Lakes/Reservoirs

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Lakes and Reservoirs
Nutrient Water Quality Standards
(*Adopted 6-01-06; Estimated Effective Date 1-07)*

Recommendations for criteria development came from an Academic Advisory Committee (AAC) formed by the VA Water Resources Research Center & consisted of scientists from several VA colleges & universities :

- **Natural lakes and constructed impoundments should be considered separately**
- **Reservoirs - recreational fish population status can be an indicator of suitability for aquatic life**
- **Chlorophyll *a* and TP recommendations were provided**
- **Nitrogen criteria should not be established**

Summary of adopted amendments to Water Quality Standards regulation:

- Definitions for five terms introduced in the amendments
- Special nutrient standards for the two natural lakes in Virginia - Mountain Lake & Lake Drummond
- Chlorophyll *a* & total phosphorus criteria for 116 man-made lakes & reservoirs, including the Occoquan Reservoir
- Application of existing dissolved oxygen criteria to the 116 man-made lakes & reservoirs

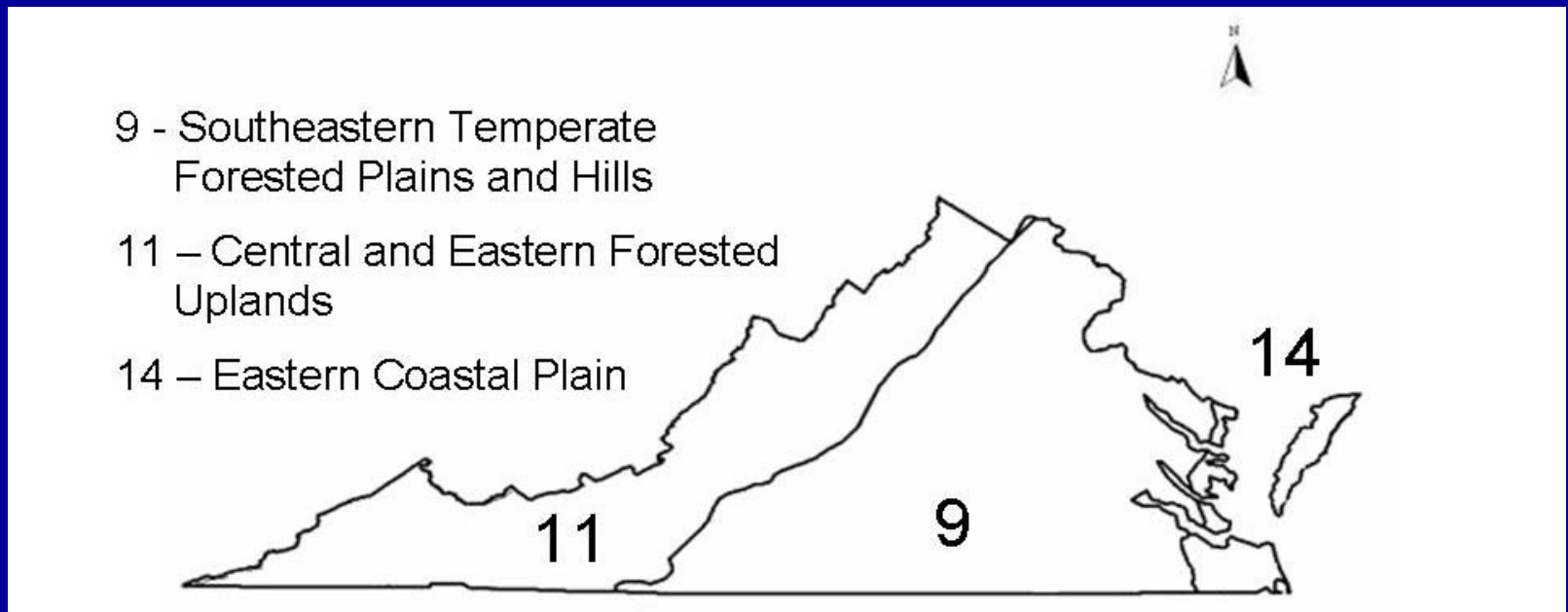
Chlorophyll *a* & total phosphorus criteria for 116 man-made lakes & reservoirs, including the Occoquan Reservoir

Lakes and Reservoirs

Seasonal (April – October) Numerical Nutrient Criteria for 116 Impoundments Based on Fishery Type & Ecoregion*

- **Chlorophyll *a***
- **Total Phosphorus (when documented use of algicides during the April – October monitoring period)**
- **Dissolved Oxygen (4 mg/l min, 5 mg/l daily average) only for upper layer (epilimnion) during thermal stratification**

** **Publicly accessible lakes > 100 acres in size & publicly accessible water supplies DEQ has previously monitored or plans to monitor***



How the AAC Determined the Maximum Nutrient Concentrations (TP and Chl-a levels) that Sustain Good to Excellent Recreational Fisheries, by Fishery Type and by Ecoregions

- **Status of recreational fishery in each impoundment rated on a scale of 1 (poor) to 5 (excellent) by VDGIF biologists, in response to requests advanced by Dr. John Ney of the AAC.**

- **Each reservoir was classified as one of the following types based on the professional knowledge of Dr. John Ney and considering VDGIF's biologists' comments during the rating process.**

  - **Coolwater Fisheries**
  - **Coldwater (Trout) Fisheries**
  - **Fertilized Fisheries**
  - **Warmwater Fisheries**
  - **Other (Affected by unique or unusual conditions that make them poor predictors of how the state's lakes could be expected to respond to water-column nutrients)**

Lakes and Reservoirs
Fisheries Designated Uses
Ecoregion 9

Includes the Occoquan Reservoir as a warmwater fishery

Coolwater Fisheries

Chl-a = 25 ug/L
TP = 30 ug/ l

***Warmwater Fisheries**

Chl-a = 35 ug/L
TP = 40 ug/ l

Fertilized Lakes

Chl-a = 60 ug/L
TP = 40 ug/ l

Subsections in section 187 (list of criteria for 116 lakes & reservoirs)

- Description of monitoring data used for assessment
- Site-specific modifications to address downstream effects
- Allowance for regulatory development of reservoir specific criteria if consultation with VDGIF when criteria exceeded confirms that the designated use is being attained

Assessment:

- **Water quality assessment of the nutrient criteria (chlorophyll *a* and total phosphorus) will be based on the two most recent monitoring years with available data.**

Address Downstream Impacts

9 VAC 25-260-187.D allows for specific modifications to the criteria if the nutrient criteria specified for a man-made lake or reservoir do not provide for the attainment and maintenance of the water quality standards of downstream waters.

Allowance for regulatory development of reservoir specific criteria if fishery use is attained when nutrient criteria are exceeded

- Added a confirmation step for reservoirs listed in Section 187 - consultation with VDGIF - to determine whether the designated recreational fishery use of the water is being attained when the numeric nutrient criteria are exceeded.

- Where the criteria are exceeded and the designated uses of the water body are being attained, the water will still be considered impaired until site-specific criteria are adopted and become effective in order to remove the water body from the impaired waters list.

PART II
STANDARDS WITH MORE SPECIFIC APPLICATION

9 VAC 25-260-187. Criteria for man-made lakes and reservoirs to protect aquatic life and recreational designated uses from the impacts of nutrients.

C. When the board determines that the applicable criteria in Section B for a specific man-made lake or reservoir are exceeded, the board shall consult with the Department of Game and Inland Fisheries regarding the status of the fishery in determining whether or not the designated use for that water body is being attained. If the designated use of the subject water body is not being attained, the board shall assess the water body as impaired in accordance with § 62.1-44.19.5 of the Code of Virginia. If the designated use is being attained, the board shall assess the water body as impaired in accordance with § 62.1-44.19.5 of the Code of Virginia until site-specific criteria are adopted and become effective for that water body.

Consultation Process with VDGIF

- When DEQ determines that the applicable nutrient criteria in Section 187 B of the water quality standards regulation for a specific man-made lake or reservoir are exceeded, the DEQ central office water quality standards program coordinator will contact the VDGIF Regional Fisheries Manager regarding the status of the fishery in determining whether or not the designated use for that water body is currently being attained.

- Since the nutrient criteria for impoundments were developed using water chemistry data from those reservoirs where VDGIF biologists rated the fishery as good or excellent, documentation should support this level of fishery.

- Appropriate documentation for confirmation of maintenance of the designated fishery use would include the most recent information available on:

  - catch per unit effort of specific size classes of managed fish populations
  - population size structure
  - observations or records regarding changes in fishing use or general trends in community structure

DEQ action after consultation with VDGIF

- If the designated use of the subject water body is not being attained, the board shall assess the water body as impaired in accordance with § 62.1-44.19.5 of the Code of Virginia.

- If the designated use is being attained, the board shall assess the water body as impaired in accordance with § 62.1-44.19.5 of the Code of Virginia until site-specific criteria are adopted and become effective for that water body.

Regulatory Adoption of Amendments to the Water Quality Standards Regulation Takes 18 - 24 Months

DEQ procedure for developing reservoir specific nutrient criteria

Develop chlorophyll *a* & total phosphorus criteria by:

- **Pool – as described in the AAC Report 2005 at http://www.deq.virginia.gov/wqs/pdf/AAC05report.pdf - All data taken down to one meter in the lacustrine portions of the reservoir over all sampling observations made between April & October for all available years during the six year assessment period.**

- **Use the statistics described for total phosphorus in the referenced AAC Report 2005 & use for chlorophyll *a the* AAC 2005 Report Addendum 1 at http://www.deq.virginia.gov/wqs/AAC%20Report%20Addendum%205-26-05.doc.**

Application of existing dissolved oxygen criteria to the 116 man-made lakes & reservoirs

Clarification on Application of Existing Numerical Criteria for Dissolved Oxygen for the 116 Man-made Lakes & Reservoirs Regulated by Nutrient Criteria:

- **Only apply to upper layer (epilimnion) during times of thermal stratification** *(The rationale for this is, if the water body is protected by and meets the nutrient criteria, then any low DO should be attributed to natural conditions and not nutrients.)*

- **Apply throughout the water column when not stratified**

Implementation Guidance

Under Development

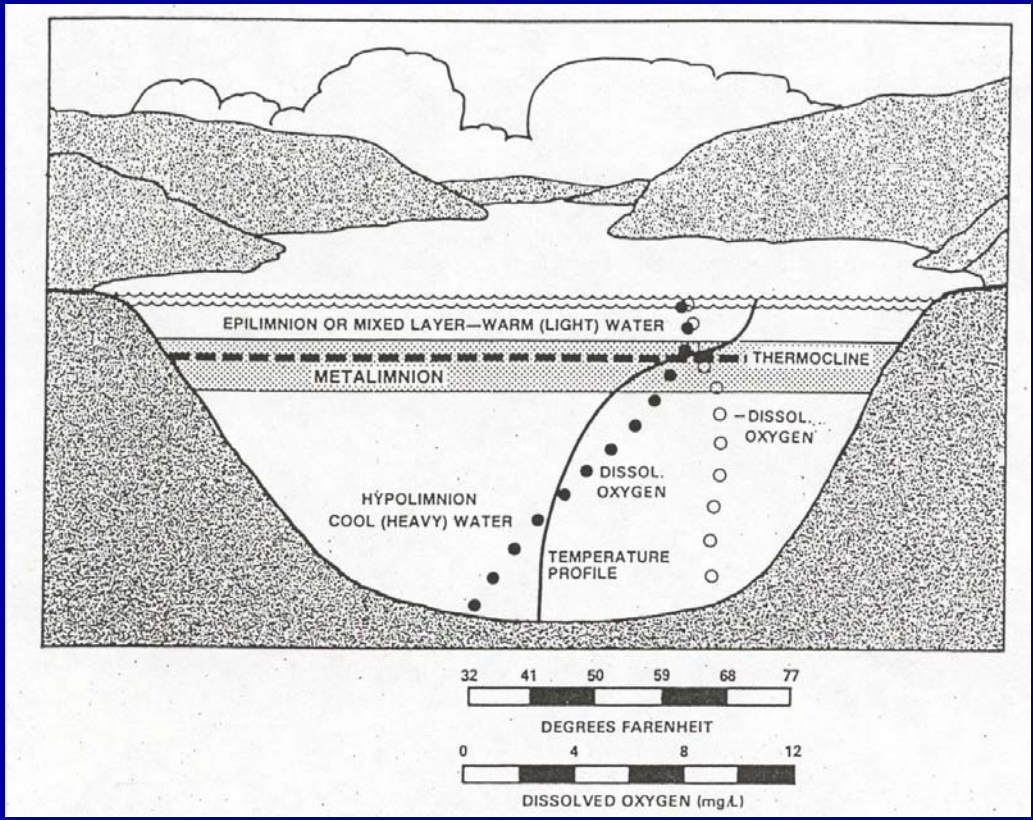
- Draft on DEQ web site at

http://www.deq.virginia.gov/wqs/documents/LAKEGUIDANCE_002.pdf

- Final by effective date of amendments

Epilimnion

Means the upper layer of nearly uniform temperature in a thermally stratified man-made lake or reservoir listed in 9 VAC 25-260-187.B.



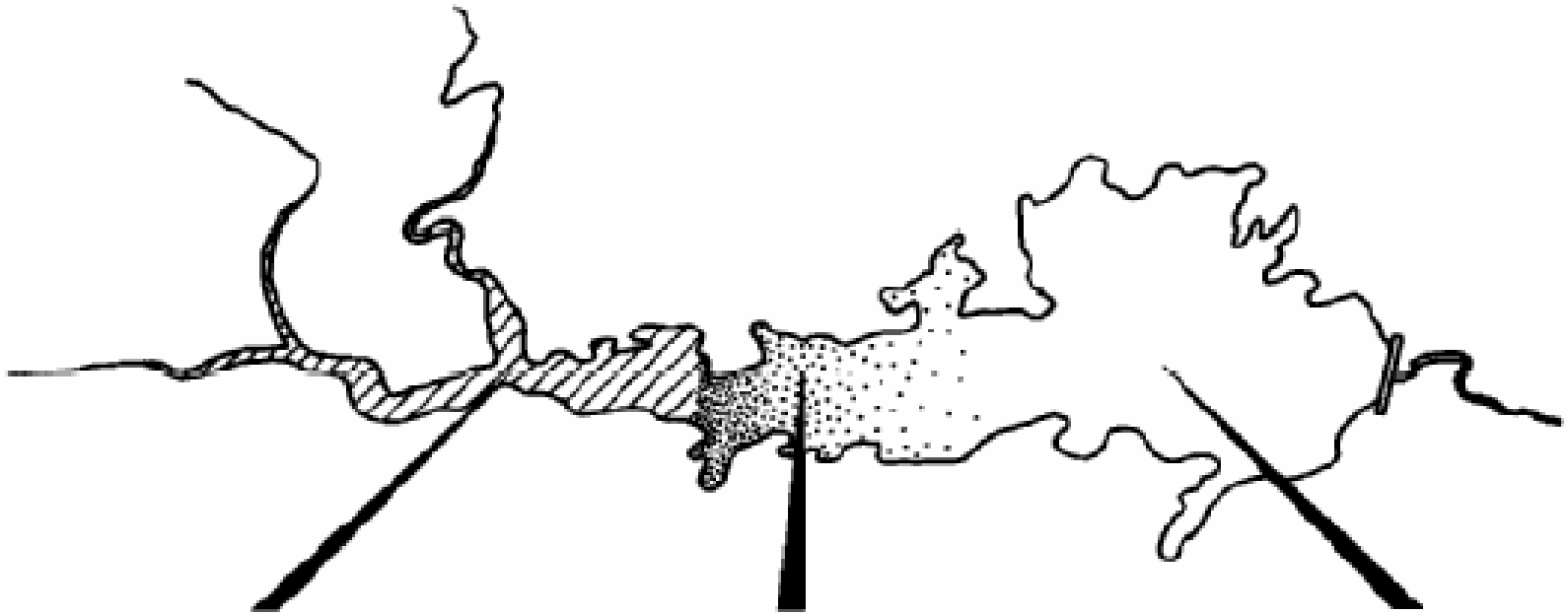
A lake is defined as stratified if the thermocline in the temperature profile can be delineated, that is, the temperature decrease is 1°C or more for each meter of descent (or equivalent to 0.55°F per foot).

Shallow lakes (those typically less than 15 -20 feet) usually do not truly stratify.

Lacustrine

Means the zone within a lake or reservoir that corresponds to nonflowing lake-like conditions such as those near the dam.

The other two zones within a reservoir are riverine (flowing, river-like conditions) and transitional (transition from river to lake conditions).



RIVERINE ZONE
- Narrow basin
- High flow
- High suspended solids, low light
- High nutrients, advective supply
- Light limited photosynthesis
- Algal cell loss by sedimentation
- Organic matter supply allochthonous
- More "eutrophic"

TRANSITIONAL ZONE
- Broader, deeper basin
- Reduced flow
- Lower suspended solids, more light
- Advective nutrient supply reduced
- High photosynthesis
- Algal cell loss by sedimentation, grazing
- Intermediate
- Intermediate

LACUSTRINE ZONE
- Broad, deep lake-like
- Little flow
- Clearer
- Internal nutrient recycling, low nutrients
- Nutrient limited photosynthesis
- Algal cell loss by grazing
- Organic matter supply autochthonous
- More "oligotrophic"